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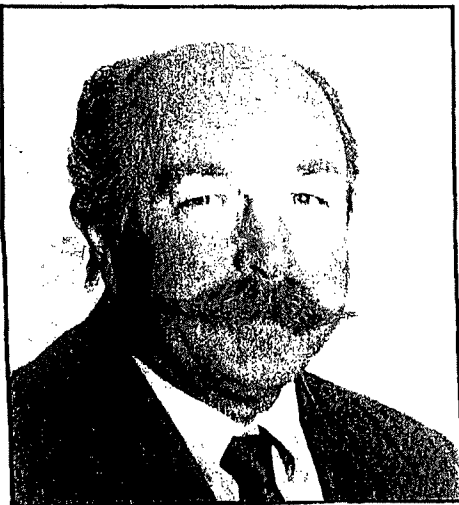


Recreational engine users gear up for changes at the pumps

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Sometimes it seems that government requirements or government red tape have been interjected into absolutely every aspect of our lives. This can be especially aggravating when we find it affecting us at our lake homes, which, in many cases, are meant to be a relaxing escape from the structure of our working lives.



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An example of such an intervention is a state law which takes effect on October 1, 1997, requiring the addition of an oxygen content to nearly all of the gasoline sold in Minnesota. Fortunately, this law will not negatively affect anyone's lifestyle, pocketbook or engine performance, and most consumers will never realize a change has taken place. Any rumors and arguments to the contrary have likely originated from special interests who have an economic stake in the formulation and sale of gasoline.

The Minnesota law in question follows the guidelines of the Federal Clean Air Act of 1990 which calls for an oxygen content of 2.7 percent in all gasoline as a means to reduce the carbon monoxide level of exhaust emissions. The great majority of areas in the country which are covered by this Clean Air mandate use either ethanol or Methyl Tertiary Butyl Ether (MTBE) to add the oxygen to gasoline. Since ethanol is the only oxygenate chosen by all Minnesota gasoline marketers, the remainder of this article will discuss the

facts as well as the myths surrounding the use of ethanol blended gasoline.

Policy reasons for ethanol

As most industries, ethanol has special interests who may benefit financially from expanded production and usage, however they are relatively few in number, consisting mostly of corn growers and owners of corn processing plants. The real political strength lies in the concept of a renewable, clean burning, high performance, domestically produced fuel to replace imported crude oil while at the same time, reducing pollution from engine exhaust emissions. Even though ethanol interests cannot compete with the budgets of the major oil companies, their strong Midwest constituencies, combined with some of these "white hat" policy attributes have resulted in some supportive legislation.

Subsidies or Economic Incentives?

When gasoline is blended with ethanol, it pays a federal excise tax of 13¢ instead of the 18.4¢ per gallon charged to non-blended gasoline. This reduction in

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the rate at which it is taxed allows gasoline marketers to pay more for ethanol than the base gasoline it is blended with and also provides an incentive for them to use ethanol. This tax break is also the incentive that the oil industry likes to refer to as "huge government subsidies". In reality, Congress recognizes that the petroleum industry also receives billions of dollars of tax breaks and subsidies, so the tax exemption for ethanol is just their attempt to level the playing field and assure the continued growth of the ethanol industry. The majority in Congress see the danger of our growing dependence on imported oil (projected to be 57 percent this year) and are trying to encourage domestically produced alternatives to crude oil.

Reasons for ethanol over imported crude oil

- National Security
- Military Costs to Protect Supplies
- Improve Farm Economy
- Improve Balance of Trade
- Increase Domestic Jobs
- Reduce Health Care Costs
- Reduce Global Warming
- Influence on Mideast Policies

Performance issues:

Many of the perceptions, rumors and myths about ethanol fall into the same category as the scare stories about unleaded gasoline when it first came out. What most consumers as well as most mechanics don't realize, it that gasoline is not a simple compound, rather it is a very complex stew of chemicals, ethanol being one of the more simple ones. These hundreds of chemicals are not combined into a consistent recipe but blended to create a gasoline that falls within a range of specifications. To further complicate matters, these specifications change with the seasons and are designed for peak performance in light trucks and automobiles, not necessarily off-road or recreational engines.

Fortunately, a blend of up to 10 percent ethanol can be used in any engine designed for unleaded gasoline and is covered under the same engine warranties. While an ethanol blend can be used interchangeably with non-blended gasoline, there are a few issues that deserve further discussion. They are: octane, enleanment, materials

compatibility, volatility, phase separation and degradation/deposits.

Octane. The octane rating of gasoline only provides an indication of the ability to resist "pinging" or "knocking." Pinging is the noise caused by gasoline igniting from cylinder heat and pressure, rather than from the controlled and timed ignition from the spark plug. The resulting "pre-ignition" or "detonation" causes a second flame front within the cylinder leading to poorer performance as well as the possibility of eventual engine damage. Pure ethanol has an octane rating of about 115 which will increase the octane number of the gasoline it is blended with by two to three points.

Materials Compatibility. The old stories about "ethanol eating up my carburetor" were only casting blame at the one component of gasoline which could be identified because ethanol blended gasoline was labeled on the pump. During the early eighties many changes were taking place in gasoline formulation as lead was being phased out. Octane was supplied by increasing the level of aromatics which are more aggressive toward the rubber and plastic "elastomer" fuel system parts. Some unscrupulous gasoline marketers added high levels of methanol which could be purchased at 30¢ per gallon but also resulted in widespread fuel system damage. These factors, combined with a proliferation of "No Alcohol in Our Gas" signs fed the perception that ethanol was to blame for a wide variety of engine problems.

Enleanment. Enleanment is a legitimate issue for certain two-stroke, high performance engines, such as snowmobiles and chainsaws. When gasoline containing oxygen is used in an engine with a fixed jet carburetor, the air/fuel mixture is said to be "enleaned"; that is, a greater ratio of oxygen to fuel enters the combustion chamber. The result is that the fuel burns more completely, engine RPMs increase, there is a greater power output as well as increased exhaust temperatures. Enleanment also happens when either the air temperature or the operating altitude decreases, since both factors cause air to become more dense and increase the oxygen content per unit of volume. Snowmobile manufacturers recommend



Governor Arne Carlson addresses 1996 Governor's Snowmobile Run participants, all of whom used ethanol-blended fuel.

changing to a larger fuel jetting when altitudes drop more than 1,000 feet, the operating temperature drops more than 30 degrees or an oxygenated gasoline is used. Reality is that most engines are set at the factory to operate slightly "rich" and don't need to be adjusted until two or more of the above mentioned factors are realized. In any event it is best to know your engine and occasionally check your spark plugs for a light tan color to determine whether the operating temperatures are within a safe range. Plugs that show black carbon deposits have been running excessively rich while white plugs indicate a lean condition and higher operating temperatures.

Volatility. The volatility, or the ability of gasoline to evaporate at ambient temperatures, changes four times a year. Simply put, gasoline must evaporate to ignite and it must evaporate at a lower temperature in the wintertime to enable ignition at cold temperatures. Gasoline volatility is measured by the Reid Vapor Pressure (RVP) method, in pounds per square inch of pressure when the temperature of a sample is increased to 105° Fahrenheit. The RVP standard is 9.0 psi in the summer and 15 psi in the winter. Ethanol increases the RVP of gasoline by about .7 of a pound, which can slightly increase the startability in the winter but can also slightly increase the propensity to vapor lock in hot weather.

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Phase Separation: Phase Separation means that a liquid has separated into different phases, or in this case that the ethanol has separated from the gasoline. This can only happen with the introduction of a relatively large amount of water, since ethanol is attracted to water. A contamination level of greater than two quarts of water (.5 percent) in one hundred gallons of ethanol blended gasoline will cause the ethanol/water to separate from the gasoline and fall to the bottom of the tank..

The positive aspect of this property is that ethanol eliminates the need for any gasoline antifreeze. After all, a 12 ounce bottle of isopropyl is nothing more than alcohol; and when added to 10 gallons of gasoline provides only about one tenth of the water holding capacity of a 10 percent ethanol blend. Therefore, continuous use of ethanol blended gasoline removes any fear of ever having a water build up in your fuel system.

Degradation and Deposits: It is not by accident that some gasoline companies advertise fresh gasoline. Gasoline really does deteriorate, lose volatility and leave

deposits of gum and varnish. Problems resulting from poor fuel handling are the number one reason that engines need repair. Old, improperly handled gasoline leads to contamination of both water and dirt, improper seasonal volatility, gum formations and even chemical reactions with certain fuel system components. The addition of an oxygenate can create different reactions over time, since it is an addition to the chemical mixture.

The best way to avoid problems is to keep all gasoline containers tightly sealed and as nearly full as possible and always use up existing supplies within 60 days of purchase. When storing a seasonal vehicle; drain the fuel system if possible or add a gasoline stabilizer, and always store any engine with the tank nearly full.

Is there any choice?

Early in this article I mentioned that an oxygenate will be required in *nearly* all the gasoline sold in Minnesota. Exceptions as stated in state statute include: "Airports, marinas, resorts, and public and private motor vehicle racecourses." In addition, "a retail gasoline station may sell unleaded, premium gasoline without oxygen provided that the

gasoline is only dispensed into a can of six or fewer gallons or into a collector vehicle, or a vehicle licensed as a collector vehicle, an off-road vehicle, motorcycle, boat, snowmobile or small engine."

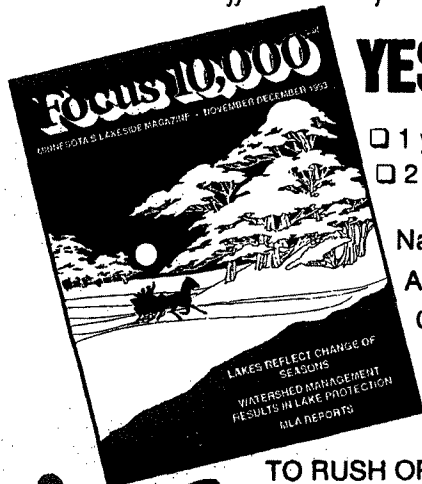
I am of the opinion that these statutory exceptions are completely unnecessary from a technical perspective but since there are still those who believe much of the propaganda about the use of ethanol in gasoline, they were necessary from a political perspective. Politics is the art of persuasion, compromise and "riling up the constituents". The ethanol issue has seen plenty of all three and the result means you will have a choice if the gasoline marketer near you decides to offer one.

The important thing to remember is that any gasoline sold within seasonal specifications will work in your lawnmower, snowmobile or chainsaw (And yes, even those disgustingly loud personal watercraft!) If you choose, you can search out the oxygen free gasoline but the most important factor in trouble free performance for your utility engines and gasoline powered toys is how you handle your gasoline after you purchase it.■

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